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Globalisation, concentration and footloose firms: in search of the main cause of the declining labour share[☆]

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Abstract

Over the last two decades the share of national income which accrues to labour has followed a marked downward trend across a host of industrialised countries. This paper attempts to assess the importance of several potential causes of this phenomenon. We investigate compositional effects, the effect of declining trade costs, changes in the market structure (concentration) and the effect of low-wage competition between countries. Overall, the findings suggest that lower trade costs and factors related to economic integration such as industry concentration, the market power of firms and increased international low-wage competition indeed affect the labour share. However, their effect has been quite limited when compared to changes in the sectoral composition, the effects of technological change, cyclical factors and changes in the prices of intermediary goods.

1. Introduction

The age old debate on how to divide the national income pie between capital owners and labour has in recent times been reignited by policy makers, politicians, trade unions and the popular press. This renewed interest in factor shares stems from the fact that over the last two decades, the labour share across a host of industrialised countries has followed a downward trend, as opposed to the periods in the 1960s and 1970s where the labour share of national income

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was considerably higher. Furthermore, citing the decline of the labour share has become somewhat of a popular rally cry for certain stakeholders seeking to promote the ills of globalisation and the need to increase the taxation of companies. Therefore, identifying those factors which help explain changes in factor shares is paramount in order to facilitate both informed debate and policy formulation.

While early studies assumed factor share constancy as one of the key regularities characterising economic growth (e.g., Kaldor (1963)), subsequent contributions have shown that factor shares have not been stable in the medium-term with several explanations being proposed Blanchard (1997); De Serres et al. (2001); Bentolila and Saint-Paul (2003); Jaumotte and Tytell (2007); Guscina (2007); Meyler (2001). Overall, no definitive theory or specific cause is able to explain all changes in factor shares. What does appear to emerge, however, is that explanations can essentially be grouped into temporary and cyclical factors such as energy prices and adjustment costs, while others can be viewed as being more structural in nature[1]

The structural factors affecting factor shares include, for example, changes in the sectoral composition of economies, technological progress, labour market policies, product market imperfections and increasing international economic integration. This paper attempts to measure in how far the European economic integration process has affected the labour share.

Within the EU, the Single Market programme, several waves of enlargement and the introduction of the euro have all contributed to increasing European economic integration over the last few decades. While previous studies examining the impact of globalisation on the labour share tend to focus on the increasing role of emerging economies such as China and India in world trade (e,g., Jaumotte and Tytell (2007); Guscina (2007)), intra-EU trade accounts for approximately two thirds of all EU trade[2].

This study therefore concentrates on the European integration process and examines how declining intra-EU trade costs among developed economies

[1]For a detailed review see European Commission (2007).

[2]External and intra-European Union trade. Statistical Yearbook 2008.

impact on the share of labour in national income.

The legacy of obstacles to trade in the EU and their subsequent dismantling has had considerable implications on European industrial structure (cfr. Lyons et al., 2001). While it is widely accepted that efficiency and welfare benefits emerge as a result of increased competition in product markets, European countries have been considerably slower in adopting anti-trust legislation when compared to the US (Mueller, 1996). In the founding Treaty of the European Community, despite incorporating strict anti-trust rules, the emphasis was on cross-border implications and not within country competition. It was not until the Maastricht Treaty that antitrust legislation in certain countries converged closer to European standards. Moreover, firms are ever more adept at employing innovative strategies in order to ensure that any rents earned are protected from strict regulation (Konings et al., 2001). Consequently, it would appear to be of interest to examine if market structure developments which occurred concurrently with the integration process in the EU have affected the labour share in Member States.

An additional channel through which the process of European economic integration might affect the labour share is through the increased mobility of firms. As firms become ever more footloose, Member States increasingly compete with each other as a means of attracting foreign direct investment. Consequently, both workers and governments can become embroiled in a race-to-the bottom, where only the country with the lowest wages or tax rates will succeed in attracting firms and employment. This paper examines whether increasing international competition contributes to decreasing labour share.

In examining these factors, a framework, building on the work of Bentolila and Saint-Paul (2003) (BS) is developed. These authors estimate the impact of changing technology, factor prices, adjustment costs and the bargaining power of unions on the labour share. In order to investigate how European economic integration affects the labour share, this study extends their model and estimates the impact of declining trade costs, foreign competition and changes in market structure. Although the empirical analysis of this paper focuses on European economic integration, the theoretical framework also applies to global economic integration. Since European economic integration

was already under way when the globalisation trend started to strengthen, it may shed some light on possible future effects of closer integration at a global scale.

A significant contribution of this paper stems from enhancing the measurement of factors explaining the labour share. For example, previous studies examining the impact of globalisation on factor shares use aggregated measures of trade openness such as the ratio of trade to GDP (Guscina, 2007; Moral and Gernre, 2007), while this study uses bilateral trade data at the industry level to construct a measure of trade openness which is derived directly from theory. In addition, the role of market structure is estimated by using mark-ups and concentration ratios derived from firm-level data, which have not been examined empirically in previous studies.

The remainder of the paper is structured as follows. Section 2 describes the evolution of the labour share and the importance of compositional effects. Some statistics on potential explanatory variables is given, such as the evolution of trade costs and industry concentration. Section 3 then introduces a small theoretical framework, making predictions on the direction of the influence of some of the suggested explanatory variables. Section 4 presents the estimation results and section 5 concludes.

2. Descriptive Analysis: The evolution of the labour share and compositional effects

2.1. The evolution of the labour share

In this study, the labour share (LS) is defined as

$$LS = \frac{LC^E + LC^S}{VA}, \tag{1}$$

where LC^E, LC^s and VA refer to labour compensation for employees, labour compensation for the self-employed and value added. A caveat in measuring these variables relates to allocating taxes on production to labour and capital. This is a complex undertaking, as there are many different types of taxes.

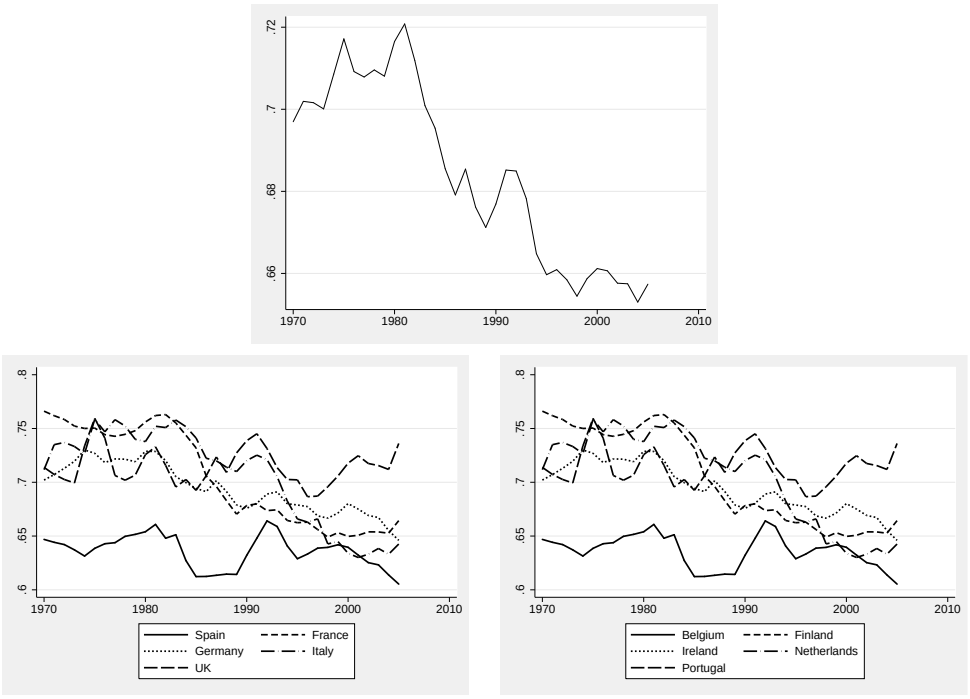

Figure 1: Labour share of the EU15 (top panel) and separately for some large EU member states (bottom panels), 1970-2005.

In the EUKLEMS database[3] which is used throughout this paper all taxes on production are allocated to capital.

The top panel of figure 1 shows the evolution of the labour share for the EU as a whole. The picture clearly shows why the evolution of the labour share has drawn much attention recently: whereas the labour share was at a high level and even increasing in the 1970s this was followed by a significant decrease in the subsequent decades. In the later years the downward trend seems to have bottomed out. The bottom panels show the evolution separately for a selection of EU member states[4]. What emerges is that the behaviour of the labour share on the EU level is reflected on the national level in most member

[3]This dataset contains detailed industry level information for the period 1970-2005. For additional details on this dataset see www.euklems.net.

[4]In the remainder of this paper 'member states' refers to the EU-15. The selection of member states is solely based on the availability of trade data, which will be used to calculate a proxy for trade costs in the empirical analysis later on.

states. Some countries such as France and Italy have experienced considerable decreases. For countries such as Belgium, Spain and the UK, the labour share in 2005 was similar to the level in 1970, however, and Portugal is an exception which experienced a significant increase. In more recent years, the decline in the labour share appears to be slowing down, or has even started to increase again, for example in the UK.

2.2. Decomposition of changes in the labour share

A simple and highly relevant potential explanation for the observed change in the aggregate labour share might be the occurrence of changes in the composition of the economy, rather than a change in the labour share of the economy as a whole. Since the time span under consideration is rather long (35 years), major compositional shifts such as the declining importance of the manufacturing sector and the increasing weight of services in the economy may play a major role in causing the observed aggregated behaviour, if these sectors have different labour shares. In this section, the relative importance of compositional changes versus changes within the composing units is examined more formally using the same decomposition as used by De Serres et al. (2001). These authors write the aggregate labour share of a multi-sector economy as the sum of the value-added weighted labour share of each sector:

$$LS_t^{agg} = \frac{\sum_{i-1}^{k} comp_{i,t}}{\sum_{i=1}^{k} va_{i,t}} = \sum_{i=1}^{k} \omega_{i,t} LS_{i,t}, \tag{2}$$

where the variables $comp_{i,t}$ and $va_{i,t}$ are the labour compensation and value added in sector i in year t, ω_i is the share of sector i in the total economy value-added and LS_i is the labour share of sector i. Differentiating over time, the change in the aggregate labour share can be split into two components;

$$\Delta LabourShare_t^{agg} = \sum_{i=1}^{k} LabourShare_{i,t} \Delta \omega_{i,t} + \sum_{i=1}^{k} \omega_{i,t-1} \Delta LabourShare_{i,t}, \tag{3}$$

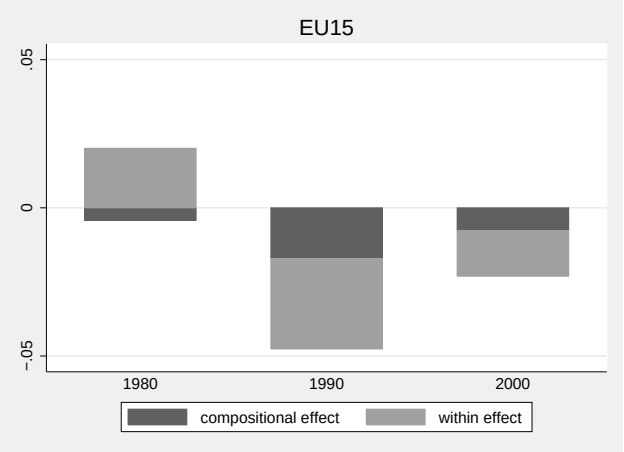

Figure 2: Decomposition of the evolution in the labour share of the EU15.

where the first term shows the effect of changes in the weight of sectors, offering an indication of the quantitative importance of the 'compositional effect' in changes of the aggregate labour share. The second term is the weighted sum of the change in labour shares within each sector ('within effect').

Figure 2 shows the decomposition of the change in the aggreage labour share of the EU 15. The bars in each figure show how the growth in the labour share in the decade preceding the indicated year can be decomposed into the change in the relative weight of forty six nace 2 industries (the 'compositional effect') on the one hand and the change of the labour share within these sectors on the other ('within effect').

Appendix B shows the sectoral decomposition of the movement of the labour share separately for all member states im our sample. What emerges is that there are large differences between countries in the relative importance of within and compositional factors as explanatory factors of the changing labour share. The compositional component has tended to decrease the aggregate labour share in most countries over the time period under consideration, with the notable exception of Portugal. The within-sector changes have been an important driver of the labour share, although the direction of the influence has been less clear cut.

We can therefore confirm the finding of De Serres et al. (2001) (who use a much smaller set of countries), that changes in the sectoral composition can

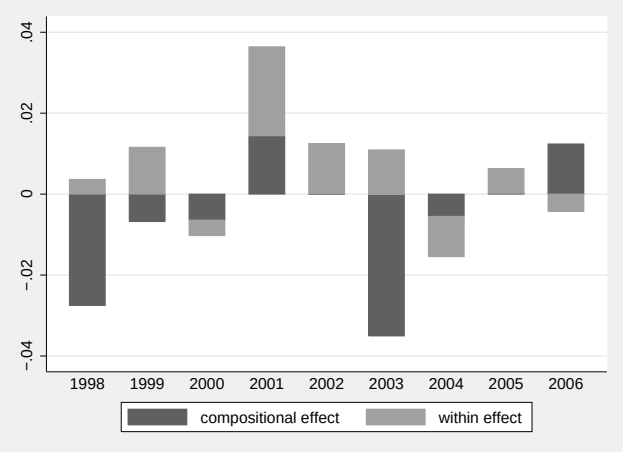

Figure 3: Decomposition of changes in the labour share in within firm changes and changes in the relative importance of firms in the overall economy.

help explain a significant part of the decline in the labour share on the aggregate level. As can be seen from figure 6, the 'within effect' for the EU15 clearly outweighs the 'compositional effect', however, and therefore the changing composition can not serve as a complete explanation for the observed decline in the labour share.

However, changes in the relative importance of sectors may not be the only type of compositional change in the economy which affect the evolution of the labour share. If the firm size distribution was affected by the European integration process, for example, and larger firms have a different labour share,[5] we may expect to find significant inter-firm compositional effects. Figure 3 presents the results of applying the same decomposition method to a sample of 46015 Belgian firms for the years 1998-2006. The firm level data comes from the commercial database Belfirst of Bureau Van Dijk. Overall, the change in the relative weight of firms ('compositional effect') appears to have had a negative influence on the aggregate labour share over the period under consideration, which was also the case for the sectoral decomposition. On average, the labour shares of individual firms increased significantly in the years 2001-2002, during

[5]We will argue below that this might be the case if large firms have more market power, or are more footloose, for example.

the economic downturn in that period, suggesting that cyclicality may be an important factor in explaining changes in factor shares.

The significant size and ambiguous direction of the within component, both at the firm and sector level suggests that a significant share of the observed variance of factor shares cannot be explained by compositional effects, and that there might be other fundamental factors driving factor shares. Moreover, the decomposition methodology remains silent on the causes of the differences in the initial (or simply long-run) levels of the labour share in the units under consideration. The remainder of this section will show a descriptive analysis of some popular explanations the declining labour share.

2.3. Inspecting the evolution of trade openness

Globalisation is often seen as one a possible cause of the declining share of labour in national income. A prediction of the classic Heckscher-Ohlin model of international trade is that the reward to labour in relatively capital intensive countries (such as the countries under consideration) declines after opening up to trade. More recent models of union wage demands with footloose firms predict that when firms become more footloose, they might be able to limit union wage demands by threatening to relocate. Globalisation may also affect the average size of firms (or the entire firm size distribution), and the fashion or intensity of competition between firms. Larger footloose firms with more market power may be expected to pay out a smaller share of their value added to employees. To investigate the aggregate effect of globalisation through such channels the measure of trade openness as derived by Head and Ries (2001) is calculated from bilateral trade data at the industry level. Head and Ries (2001) argue that under reasonable assumptions following measure ϕ of the 'freeness of trade' which is inversely related to trade costs can be calculated using only trade and production data

$$\phi_{ijkt} = \sqrt{\frac{m_{ijkt} m_{jikt}}{m_{iikt} m_{jjkt}}}. \tag{4}$$

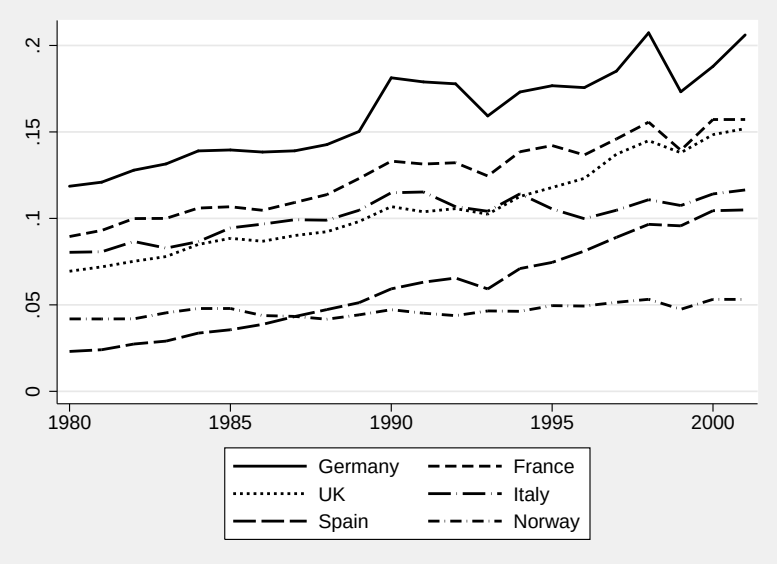

Figure 4: The evolution of trade openness with respect to the EU

Here, m_{ijkt} is the value of the trade flow of industry k from country i to country j at year t and $m_{iikt}$is the trade flow of industry k to itself (or exports to itself)[6]. The value of ϕ ranges from 0 to 1, with 0 indicating prohibitive trade costs and 1 costless trade.

Figure 4 illustrates the evolution of trade openness (ϕ) with respect to the EU15 for a selection of large member states plus Norway, for the period 1980-2003[7].

What transpires is that the degree of trade openness increased significantly over this period. Spain became much more integrated following its accession to the EU in 1986. Norway did not experience the large increase of trade openness with respect to the EU such as Spain and the other member states, strongly suggesting that the European integration process through various policies implemented by the EU was the main driver behind the intra-EU decline in trade costs. The fact the decline in the labour share occurred concurrently with this significant decline in trade costs makes it suggestive to draw conclusions about a causal relationship. The fact we observe both the labour share and the

[6]This is calculated as production minus exports.

[7]Trade data is not available for Ireland, Greece, Luxembourg, Slovenia and Cyprus.

measure for trade openness over many years, for different countries, and for different industries will allow to investigate this hypothesis in a more formal framework in section 4, where we will also be able to control for other factors affecting the labour share.

2.4. Globalisation and market structure

For some, globalisation for many brings the image of large multinationals, who by their sheer market power are able to exploit the local workforce, or at least are able to limit the bargaining power of labour unions. In this section we briefly consider whether increasing economic integration indeed has been accompanied with increasing concentration and higher markups for firms.

For this analysis we draw on the reported company accounts of European manufacturing firms from the AMADEUS database. This commercial database collected is by Bureau Van Dijk[8]. The data is based on a standardised format of company accounts with the data covering balance sheet, and profit and loss variables. Merging several earlier versions of the database, measures for industry concentration in the manufacturing sector for the period 1991-2005 are constructed[9].

Using this dataset we calculate concentration measure, expressing the share of sales of the largest firms in an industry. Very few official statistics report concentration ratios at the 2 digit nace level so by using individual firm level data it is possible to calculate industry specific concentration ratios. The data comes from merging different versions of the AMADEUS dataset and spans the period 1991-2005.

This table reveals some remarkable facts about the evolution of market concentration in the EU over a period 15 years which has been characterised by intensive economic integration. The first column of the table shows the evolution of sales of the single largest firm in each industry in our sample, as a share of total sales in that industry. There has been a substantial increase in the

[8]Previous papers to use the Amadeus dataset include Huizinga and Laeven (2007); Klapper et al. (2006); Budd et al. (2005).

[9]The data coverage in Amadeus varies across countries with Spain, Italy, France, Belgium and the UK being the most extensively covered.

year	c1	c2	c4	c8	c16	c32	m
1991	0.195	0.280	0.387	0.509	0.644	0.752	0.279
1996	0.217	0.291	0.391	0.507	0.634	0.738	0.256
2001	0.235	0.307	0.403	0.509	0.625	0.726	0.252
2005	0.252	0.309	0.398	0.507	0.623	0.724	0.245

Table 1: Concentration measures and the Lerner index m

relative sales of the largest firm over the years covered in our sample. Which firms lost in terms of the sales share? The next 6 columns of the table show the share of sales made by the 2,4,8,16 and 32 largest firms respectively. Consider the $c2$ measure. If the two largest firms gain a total of 2.9 percentage points in sales, but the largest firm on its own gains 5.7 percentage points, this implies the second largest firm actually lost market share, on average. Similarly, the other c-measures indicate a loss of market share for the largest firms *with the exception of the single largest firm*, relative to all other firms in the economy.

This descriptive analysis points to a specific kind of evolution in the firm size distribution, where only the very large firms grow even larger, and the rest of the distribution seems be become less skewed, somewhat more uniform. A possible cause could be that due to the European integration process only the very large firms are able to compete on the truly trans-European level, and this segment underwent a period of intensive consolidation to reap the benefits of production on a larger scale, whereas for the majority of firms, European integration brought mainly an intensification of competition, both competition from abroad and competition from smaller firms, which were able to increase their market share during the period under consideration.

Since the analysis of the evolution of market concentration shows a mixed picture, it is hard to predict this evolution translated in to shifts in the average market power of firms[10]. The last column of table 2.4 shows the evolution of the average mark-up in all countries and sectors as measured by the Lerner-index[11]. Clearly, the average markup seems to have declined over the years in

[10]Of course, there is more to the evolution of market power in a sector than the evolution of concentration.

[11]These are estimated using the method of Hall (1988).

our sample.

To investigate whether these trends in concentration and market power relate to the European integration process, a small regression analysis was done, the results of which are shown in table 2. While controlling for country-sector

Dependent variable:	c4	Lerner index	Lerner index
ϕ	-0.120^{**}		-0.221^{***}
	(0.0575)		(0.0647)
c4		0.0677^{*}	
		(0.0380)	
constant	0.628^{***}	0.213^{***}	0.292^{***}
	(0.0198)	(0.0245)	(0.00733)
Observations	1045	1183	1957

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Fixed effects regressions relating trade costs, market concentration and the markup

fixed effects, these regressions confirm the intuition that (column 1) increasing freeness of trade ϕ has is associated with with a decrease in concentration; (column 2) increasing concentration is associated with higher markups; and (column 3) increasing freeness of trade ϕ is associated with lower markups.

How and to what extent these factors can help explain the declining labour share will be the subject of sections 3 and 4 respectively.

3. Theoretical Framework - Factors driving factor shares

This section presents a theoretical framework which can be employed to understand how different factors can be expected to affect the share of labour in national income. We commence by introducing the basic framework developed by Bentolila and Saint-Paul (2003). These authors show that with a constant returns to scale technology with capital and labour as sole factors of production, and allowing for labour augmenting technological change, a strictly monotonic relationship emerges between the labour share and the readily observable capital-output ratio. BS then discuss several deviations from this framework

and how they can be expected to shift the relationship between the labour share and the capital output ratio. We will proceed in a similar fashion. The basic framework of BS in described in section 3.1. Section 3.1.2, 3.1.3 and 3.1.4 discuss respectively how capital augmenting technological change, prices changes of intermediate goods and hiring and firing costs affect the relationship between the labour share and the capital output ratio. Section 3.2.1 examines possible channels through which declining trade costs and foreign competition could affect factor shares, while section 3.2.2 examines the effects of changes in market structure.

3.1. The basic framework of BS

3.1.1. The benchmark BS model

To explain changes in the labour and capital share, it is necessary to make some assumptions on the technology of firms. In light of this, our starting point is the same flexible specification for technology as in BS. In their model, output (Y) is produced using labour (L) and capital (K), with $Y = F(K, BL)$ and F is homogeneous of the first degree. The parameter B allows for labour augmenting technological progress. Define $l = BL/K$ and $f(l) = F(1, l)$, which allows Y to be rewritten as $Y = F(K, BL) = Kf(l)$. The definition of the labour share then becomes

$$LS \equiv \frac{wL}{pY} = \frac{wl}{pBf(l)}. \tag{5}$$

Writing $k = K/Y = 1/f(l)$ for the capital-output ratio shows that there exists a one-to-one relationship between l and the capital-output ratio k, as f is monotonic.

In the case of perfect output and labour markets, labour demand is defined by setting the marginal cost of labour equal to marginal revenue $w^c = pBf'$, where w^c stands for the competitive wage, p is the market price and f' is the derivative of f with respect to its sole argument l. This implies the share of labour is simply

$$LS = \frac{lf'(l)}{f(l)} = g(k), \tag{6}$$

where the second equality follows from the fact that $k = 1/f(l)$, and thus defines a one-to-one relationship between the readily observable capital-output

ratio k, l and the labour share. Various elements contained in this simple framework, such as capital accumulation, changes in factor prices of labour and capital, labour augmenting technological change do *not* affect this relationship between the capital-output ratio and the labour share. What follows in the remainder of this section is a discussion of several important deviations from the base model which could offer alternative explanations for the observed change in the labour and capital share

3.1.2. Capital augmenting technological change

An important stylised fact of economic growth over the last hundred years is the relative constancy of the rate of return to capital and the steady increase of wages over time. Acemoglu (2003) recently developed a theoretical model with a constant rate of return to capital, increasing wages and a constant labour share along the equilibrium long run growth path. In his model, firms can invest in labour and capital augmenting technological change. In the long run, firms optimally invest only in labour-augmenting innovations and the share of labour in national income is constant. After a shock, however, there might indeed be capital-augmenting technological change with the possibility of factor shares deviating from their long run equilibrium levels. These empirical and theoretical findings suggest that modelling technological change as purely labour augmenting is a reasonable approximation.

The model of Acemoglu (2003) suggests capital augmenting technological change might occur off the steady-state growth path, and this is accompanied by changes in the factor shares. The BS model is not dynamic, but allowing for capital augmenting technological change in the production function via $Y = F(AK, BL)$, changes equation 6 into

$$LS = Akg(Ak)f'(g(Ak)). \tag{7}$$

This clearly shows that capital augmenting technological change induces shifts of the entire $LS - k$ relationship.

3.1.3. Intermediary input prices

Changes in the relative prices of additional factors of production, such as materials or energy and services equally shifts the entire LS-k schedule. Assuming $Y = F(K, BL, M)$, where M stands for materials, for example, makes the labour share a function of the capital-output ratio, but also of the real price of the material input q/p. Assuming CES as specific functional form of the production technology BS show that the more labour and capital are substitutes (complements), the more a rise in the price of material inputs will decease (increase) the SL-k schedule and thus, assuming a constant capital-output ratio, a lower (higher) labour share.

3.1.4. Counter-cyclical labour share: adjustment costs

In addition, a key characteristic of labour markets in general and particularly in many EU Member States, is that they are rigid. If it is expensive for firms to hire and fire workers, this will affect how the labour share behaves throughout the business cycle. If firing a worker is expensive, then labour demand will remain above the frictionless level as the real marginal cost of labour is lowered by the firing cost. This implies that, all else being equal, the labour share will increase during economic downturns. The reverse also holds in presence of hiring costs and economic upturns[12]. This paper follows the approach of BS, controlling for adjustment costs by including the growth of employment in the labour share regression (with a negative coefficient expected).

3.2. Additions to the BS model

3.2.1. Economic integration and footloose firms.

Increasing foreign competition and the risk of firms relocating to other jurisdictions in the pursuit of cost savings, are often perceived as factors which limit the scope for union wage demands and as an important source of the downward pressure on wages and thereby, the share of labour in national income. In this section, a small theoretical framework is developed, where the

[12]The relationship between the labour share and cyclicality is examined in several studies. Kydland and Prescott (1990), show that in OECD countries, the labour share is indeed countercyclical. Vermeulen (2007) corroborates this finding for France.

optimal union wage demand is affected by economic integration and foreign competition[13].

Assume an economy containing unionised firms in which bargaining takes place over both wages and employment (efficient bargaining). Unions aim to maximize the total wage bill wL and take employment at the competitive wage w^c as an outside option during wage negotiations. Firms seek to maximize their profit $pY - wL$ and take the net potential foreign profits $\overline{\Pi}$ as their outside option (threatening to relocate should negotiations fail). Although a full model describing foreign profits is not developed, $\overline{\Pi}$ can reasonably be assumed to be a function of relocation costs and foreign wages or some other measure of foreign production costs. Bargaining cooperatively, the union and the firm maximize the generalized Nash product

$$\Omega = [wL - w^c L]^{\beta}[(pY - wL) - \overline{\Pi}]^{1-\beta} \tag{8}$$

by setting wage and employment levels. β and $1-\beta$ measure union and firm bargaining strength respectively. Taking the derivative with respect to wages, the bargained wage can now be expressed as the weighted average of the union outside option wage and the surplus of revenue above potential foreign profits, per worker

First, consider two extreme cases. In the case where unions do not have any bargaining power ($\beta = 0$), then wages are equal to the competitive wage w^cprevailing in non-unionized firms. On the other hand, if unions have full bargaining power ($\beta = 1$) and firms do not have an outside option ($\overline{\Pi} = 0$, for example due to moving costs being prohibitively high), then unions are able to appropriate all of the operation rents pY in the form of higher wages. In this scenario, wages are equal to the operating revenue per worker, the maximum wage which can be paid without making losses. However, if firms can credibly threaten to relocate ($\overline{\Pi} > 0$), bargaining takes place only over $pY - \overline{\Pi}$. In the limiting case where foreign profits equal the operating profits of a non-unionised firm $\overline{\Pi} = pY - w^c L$, the threat of delocalisation is perfect

[13] This approach is in line with that of Mezzetti and Dinopoulos (1991).

and the union can not make any wage demands above the competitive wage, irrespective of its bargaining power.

Using the expression for the bargained wage in equation , the following expression for the labour share in case of efficient bargaining is obtained:

$$\begin{aligned} LS = \frac{wL}{pY} &= (1-\beta)w^c \frac{L}{pY} + \beta \frac{pY - \overline{\Pi}}{L} \frac{L}{pY} \\ &= (1-\beta)g(k) + \beta(1 - \frac{\overline{\Pi}(w^F, \phi)}{pY}) \end{aligned} \tag{9}$$

From equation (9) it is clear that the labour share still depends on the capital-output ratio through k (as it did in the perfectly competitive case), but now the labour share also depends on the bargaining power of the union and the level of potential foreign profits, which are in turn affected by foreign wages. Transport costs do not necessarily alter the level of potential foreign profits, but they do alter whether these are relevant during wage negotiations: if transport costs are very high, firms do not have the choice to relocate (a part of production) and supply local customers from abroad. If firms cannot threaten to relocate, this solution coincides with BS (cf. p.14 in their article). Alternatively, if firms become more footloose (for example because trade becomes freer) or if foreign wages decline, then relocation becomes a more credible threat. This would then result in lower wages and a lower labour share. Therefore, foreign wages and a measure for the openness of trade ϕ are included as explanatory variables when modelling the evolution of labour and capital shares. A detailed description of the trade openness measure is presented in section V.

3.2.2. Market structure, economic integration and markups

If output markets are not perfectly competitive, optimal labour demand no longer follows from $w^c = pBf'$. In this situation, firms hire labour up to the point where marginal costs w^c equals marginal revenue $p[1 + 1/\varepsilon]$, where ε refers to the price elasticity of the demand for output of the firm. The labour demand equation then becomes $w^c = pBf'[1 + 1/\varepsilon] = pBf'/m$. Here m is the Lerner index, the factor by which prices exceed the marginal cost of production.

The labour share then becomes

$$LS = \frac{g(k)}{m}$$

Or in the case of efficient bargaining (assuming unions ignore the effect their actions might have on the price setting behaviour of firms):

$$LS = \frac{wl}{pBf} = (1-\beta)\frac{g(k)}{m(\phi,\rho)} + \beta(1 - \frac{\overline{\Pi}(w^F,\phi)}{pY}). \tag{10}$$

In the workhorse Dixit-Stiglitz model of monopolistic competition markups are constant and solely depend on the parameter controlling the price elasticity of substitution between varieties. Despite the many advantages of the Dixit-Stiglitz framework, the fact that markups are constant has long been recognised as a rather unrealistic property of this model. Since then, various models of international trade have been developed where markups are time variant and depend on, for example, trade openness (ϕ) (see Ottaviano et al., 2002), or the extent of concentration (ρ) in an industry (Melitz and Ottaviano, 2008). Following from this, in this paper, the markup m is assumed to be a function of trade openness and concentration, with $m_\phi < 0$ and $m_\rho > 0$. The reverse effects also hold for the labour share, which - at least as far as the effect through changes in the markup - is increasing in the openness of trade and decreasing in the level of concentration. It is worth noting that even in this simple model the predicted effect of trade on the labour share is ambiguous. Freer trade simultaneously increases the outside options of firms (leading to a lower labour share) while also decreasing their market power (increasing the labour share).

4. Empirical estimation

As outlined in section 3.1, the framework of BS suggests augmenting following basic relationship

$$\log(LS_t) = \beta_0 + \beta_1 \log(K_t/Y_t) + \varepsilon_t, \tag{11}$$

with several explanatory variables which cause deviations from the LS-k relationship. Our preferred estimation specification takes the following form

$$\begin{aligned}\log(LS_{it}) = \beta_0 + \beta_1 \log(K_{it}/Y_{it}) + \beta_2 \log(TFP_{it}) + \beta_3 \log(p^I_{it}/p_{it}) \\ + \beta_4 \Delta \log(L_{it}) + \beta_5 w^F_{it} + \beta_7 \phi_{it} + \beta_8 m_{it} + \varepsilon_{it}\end{aligned} \tag{12}$$

where for each year t and sector i $\log(LS_{it})$ represents the log of the labour share, $\log(K_{it}/Y_{it})$ is the log of capital-output ratio, $\log(TFP_{it})$ is the log of total factor productivity, $\log(p^I_{it}/p_{it})$ is the log of intermediates prices, $\Delta \log(L_{it})$ represents employment growth, w^F_{it} is the log of foreign wages, ϕ_{it} trade openness and m_{it} are proxies for the market power of firms such as industry level markups and concentration levels.

4.1. Results

When estimating equation 12 in levels the test by Wooldridge (2002) strongly rejected the absence of autocorrelation in the residuals. Estimation therefore was done after taking first differences.[14] Table 3 shows the result of estimating equation 12 on first differences, using OLS with country/industry fixed effects and year dummies, Table 3 does not include the concentration measures, as these are available only for the years 1991-2004, and therefore including them would substantially reduce the sample size. The sample in 3 covers the years 1980-2001 and contains 96 country/sector combinations. The same sample is retained over the different reported specifications, as to obtain comparable results.

Column 1 shows the results including most of the covariates suggested by BS. All coefficients have the expected sign and are significant. The fact the coefficient on *logcapoutput* and *logTFP* have the same sign is as expected under the assumptions of BS. The coefficient on *loginterprice* is positive and large, which is in contrast to the rather small effect measured by BS using the relative price of oil. A partial explanation for this could be the fact we include all intermediate inputs. The coefficient on employment growth is negative

[14] Regressions using the Baltagi and Wu (1999) estimator lead to the quantitatively identical results

Dependent variable: loglabshare	(1)	(2)	(3)
logTFP	-0.602^{***}	-0.602^{***}	-0.605^{***}
	(0.0197)	(0.0202)	(0.0202)
logcapoutput	-0.101^{***}	-0.101^{***}	-0.0962^{***}
	(0.0146)	(0.0148)	(0.0149)
loginterprice	0.407^{***}	0.407^{***}	0.413^{***}
	(0.0138)	(0.0138)	(0.0140)
dlogemp	-0.272^{***}	-0.272^{***}	-0.271^{***}
	(0.0455)	(0.0456)	(0.0457)
ϕ		0.00162	-0.0272
		(0.0454)	(0.0474)
lerner			-0.0205
			(0.0214)
logwageEU			0.0420^{**}
			(0.0210)
Observations	1886	1886	1886

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Estimation of the basic equation and extensions

indicating that there is weak evidence for the existence of adjustment costs with firms retaining more staff during economic downturns (leading to a higher labour share) as compared to the frictionless case.

Column two shows includes ϕ as an explanatory variable. The short theoretical considerations made in the last section suggests the sign on this variable can not be readily predicted. Whereas freer trade is expected to make firms more footloose and thus limit the bargaining strength of unions and thus leading to a lower labour share, freer trade is simultaneously predicted to increase the labour share if freer trade implies lower markups. Given the fact this variable is a widely accepted measure of trade costs and has been meticulously constructed using country-sector level data for a long time period, the fact the estimated coefficient is not statistically different from zero might come as a disappointment. It is important to note, however, that the coefficient is actually rather precisely estimated. Although it can not be confidently be stated that the effect of freer trade is positive or negative, it is known with a high degree of certainty that the coefficient is neither very small or very large.

The last column of table 3 controls for some of the channels through which we expected trade liberalisation to affect the labour share, while allowing for a direct effect of trade freeness, via channels not covered in the model. Foreign wages and the industry level lerner index as used as proxies for foreign low-wage competition and the market power of firms respectively. Higher foreign wages are predicted to increase union leverage [15], and indeed the estimated effect is positive. An increase in firms' market power as measured by the Lerner index leads to a lower labour share, as predicted.

An important question is in how far these variables are able to explain the significant changes in the labour share. Table 4 tries to answer this question by showing standardised coefficients. These express by how many standard

	Lower bound	Estimate	Upper bound
logTFP	−0.719	−0.675	−0.631
logcapoutput	−0.810	−0.621	−0.432
loginterprice	0.360	0.386	0.412
dlogemp	−0.0698	−0.0524	−0.0351
ϕ	−0.0555	−0.0126	0.0303
lerner	−0.0432	−0.0141	0.0148
logwageEU	0.00130	0.0630	0.125

Table 4: Standardised coefficients and 95 percent confidence interval, 1980-2001

deviations the dependent variable is predicted to change after a one standard deviation of each independent variable separately. As the typical movement of the dependent variable is one standard deviation, a small number implies the independent variable under consideration can not by itself be a sufficient explanation for the observed change in the dependent variable. Contrary to common practice, the standardised coefficient is reported alongside an upper and lower boundary of an 95 percent confidence interval. The standardised coefficients clearly show that it is highly unlikely that changes in the trade freeness, changes in market power, or foreign low-wage competition can explain

[15] And probably affect the local labour share through different other channels in an open economy context, which we attempt to control for by including it.

the observed decline of the labour share. The effect of these variables is dwarfed by the effect of prices of intermediates, for example.

Table 5 does include the c4 market concentration measure, which comes at the cost of loosing the years 1980-1991 in the sample. Estimation is markedly

Dependent variable: loglabshare	(1)	(2)	(3)
logTFP	-0.804^{***}	-0.798^{***}	-0.788^{***}
	(0.0460)	(0.0477)	(0.0473)
logcapoutput	-0.199^{***}	-0.195^{***}	-0.177^{***}
	(0.0380)	(0.0392)	(0.0392)
loginterprice	0.588^{***}	0.588^{***}	0.599^{***}
	(0.0260)	(0.0260)	(0.0257)
dlogemp	-0.321^{***}	-0.319^{***}	-0.325^{***}
	(0.0582)	(0.0584)	(0.0578)
ϕ		-0.0305	-0.0667
		(0.0686)	(0.0693)
lerner			-0.0932^{**}
			(0.0390)
c4			-0.0368
			(0.0228)
logwageEU			0.180^{***}
			(0.0456)
Observations	728	728	728

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Estimation of the basic equation and extensions

more precise for these later years in the sample (1991-2001). Although some of the variables capturing the various channels of globalisation are now significant the standardised coefficients show they are still unable to explain a significant share of the change in the labour share. Of all the variables considered in the analysis, the relative price of intermediate goods turned out to have the largest effect on the labour share, both in terms of classical and standardised coefficients. Figure 5 again shows the evolution of the labour share in our sample, superimposed with the log of the real price of intermediates. Both variables clearly move very much in line. In contrast to to descriptive nature of the relationship shown in the figure, the results in this section allow to state

	Lower bound	Estimate	Upper bound
logTFP	−0.609	−0.546	−0.481
logcapoutput	−1.41	−0.985	−0.556
loginterprice	0.252	0.275	0.298
dlogemp	−0.808	−0.599	−0.039
ϕ	−0.104	−0.0344	0.0357
lerner	−0.102	−0.0559	−0.0101
logwageEU	0.110	0.219	0.328

Table 6: Standardised coefficients and 95 percent confidence interval, with c4-measure, 1991-2001

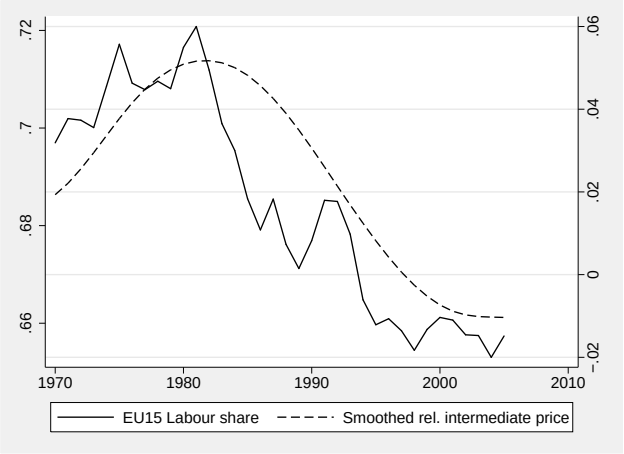

Figure 5: The evolution of the labour share and the real price of intermediary inputs.

that the evolution of the price of intermediary goods such as energy is indeed the most likely cause of the observed decline in the labour share.

Column (1) shows the results of estimating the regression of BS, where a quadratic relationship between the capital-output ratio and the labour share is incorporated. What transpires is that TFP, which captures the effect of both labour augmenting technological progress (which is not predicted to affect the LS-k schedule) and non-labour technological progress (which is expected to shift the LS-k schedule downwards), is negative (as expected) and statistically significant. In addition, the coefficient on prices of intermediates is positive and statistically significant which is in line with the findings of BS. In a non-reported specification, positive and negative changes in employment were

introduced as separate regressors to allow for asymmetric adjustment costs. The estimated coefficients were 0.005(0.05) and -0.095(0.042), respectively, suggesting adjustment costs are indeed asymmetric, with firing being more expensive than hiring.

5. Conclusion

This paper, using a number of approaches, examined the evolution of the labour share in the EU while also exploring several explanations for these observed changes. The paper starts out by examining the importance of compositional effects in explaining changes in the labour share. What transpires is that the change in the relative weight of sectors with a relatively low labour share in an economy has tended to decrease the aggregate labour share in most countries. Furthermore, within sector changes have also been an important factor driving the labour share. The direction of its influence has been somewhat ambiguous. Using detailed firm level data for Belgium, changes in the relative weight of firms also appears to have a negative influence on the aggregate labour share, which echoes the industry level findings. The decomposition of yearly changes suggests cyclicality plays an important role in explaining changes in factor shares.

As a means of examining additional factors driving changes in the labour share, this paper builds on the framework of Bentolila and Saint-Paul (2003) by examining how economic integration via declining trade costs, foreign competition and changes in market structure, impact on the labour share. These theoretical predications are then empirically tested and what emerges from the data is in line with these predictions. An increase in foreign wages increases the labour share, which is in line with the theory that weaker foreign competition reduces the viability of relocation as an outside option for firms. Furthermore, industry concentration measures are constructed using firm level data and it emerges that industries with higher concentration levels are associated with lower labour shares as predicted by theory. Freer trade and sectors with higher markups are found not to have a statistically significant affect on the labour share. Apart from being non-significant, the confidence interval of the standardised coefficients of these variables, expressing how well these variables

can explain the observed overall change in the labour share, indicates these variables are by no means the main cause of the observed decline in the labour share

Overall, the findings suggest that the European integration process lowered the labour share by a small amount, if at all. In any case the effect of economic integration and changes in the market structure is quite limited when compared to the effects of technological change and prices of intermediary goods, such as energy prices.

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A. Variables

- labshare = nominal labour compensation / nominal value added
- loglabshare : log(labshare)
- TFP : Measure of sector-level TFP provided in the EUKLEMS dataset.
- capoutput = capital stock index / real value added.
- interprice = intermediate input prices / gross value added price
- Dlogemp : Growth of employment.
- wageEU = (Total compensation to EU countries excluding own) / (Total employment in EU excluding own))
- ϕ: See section 3.3
- lerner: the industry level mark-up estimated using the Hall method. Three separate estimate are made per sector, each having a time-span of 12 years.
- C4 concentration ratio = sum of sales of four largest firms in an industry/total sales in that industry

B. Evolution of intra-EU trade costs and sectoral decomposition

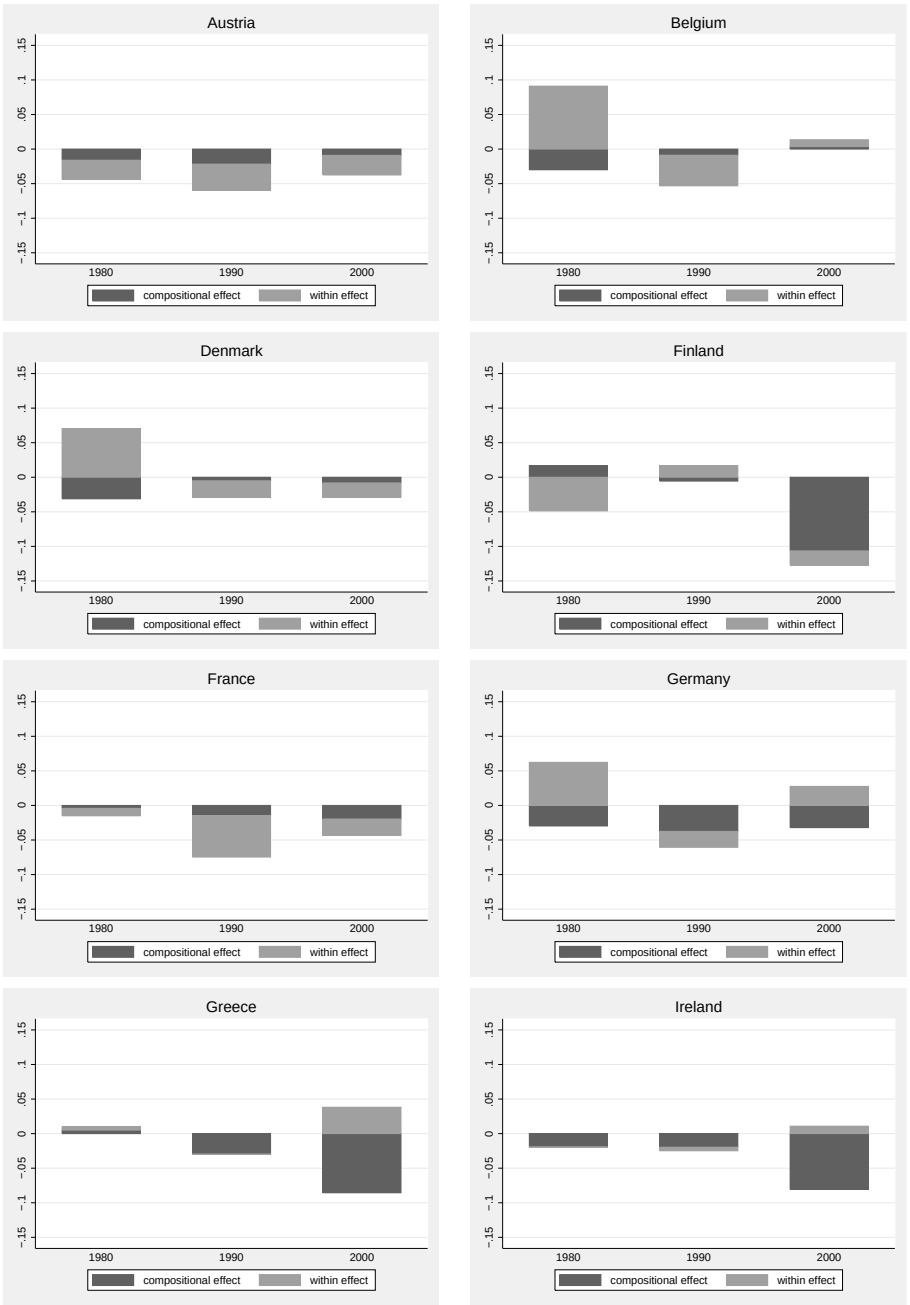

Figure 6: Decomposition of changes in the labour share in within sector changes and changes in the relative importance of sectors in the overall economy. The bars for both effects are stacked if they have the same sign. The length of a bar gives the change (attributable to that component), during the decade ending at the indicated year.

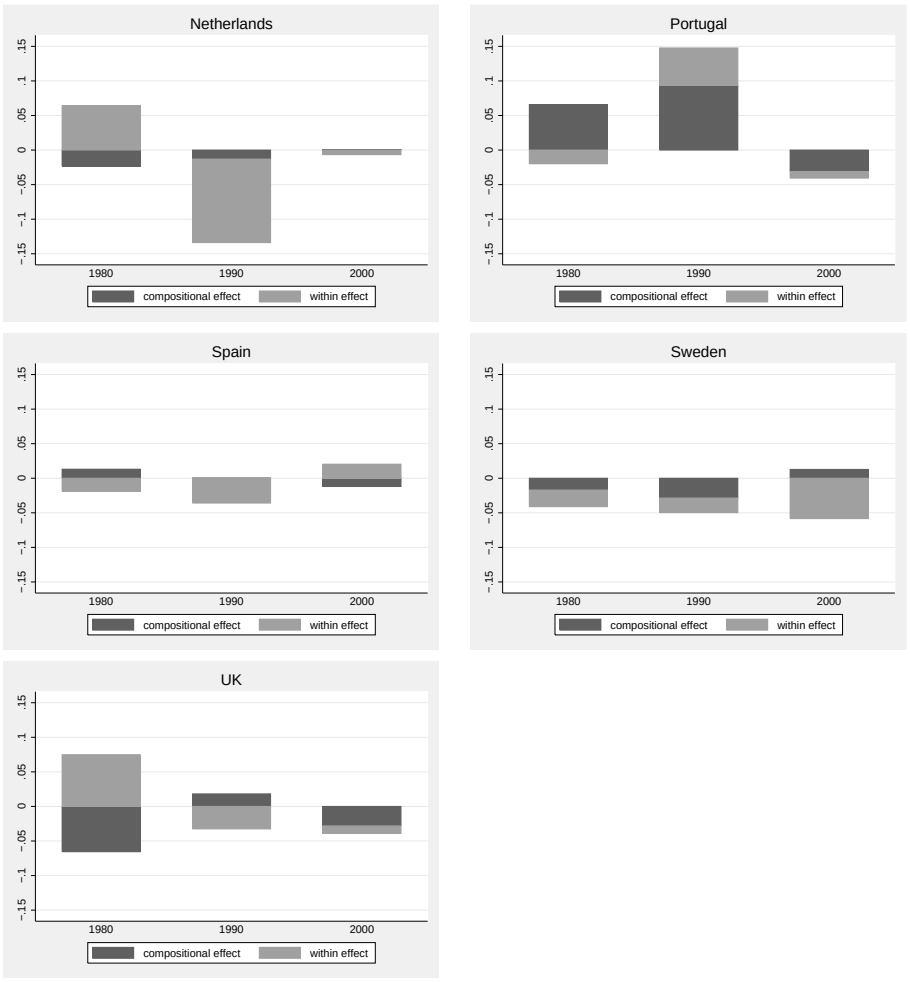

Figure 7: . . . Continued from last page: decomposition of changes in the labour share in within sector changes and changes in the relative importance of sectors in the overall economy.